

Management Plan for Antarctic Specially Protected Area No 137

NORTH-WEST WHITE ISLAND, McMURDO SOUND

1. Description of values to be protected

An area of 150km² of coastal shelf ice on the north-west side of White Island was originally designated by Recommendation XIII-8 (1985, SSSI No 18) after a proposal by the United States of America on the grounds that this locality contains an unusual breeding population of Weddell seals (*Leptonychotes weddellii*) which is the most southerly known, and which has been physically isolated from other populations by advance of the McMurdo Ice Shelf and Ross Ice Shelf (Map 1). The original boundaries were adjusted in 2002 (Measure 1) in light of new data recording the spatial distribution of the seals on the ice shelves. In the south, the boundary of the Area was shifted north and east to exclude the region north of White Strait where no observations of the seals have been recorded. In the north, the Area was extended to encompass an additional part of the Ross Ice Shelf in order to ensure inclusion of more of the region within which the seals may be found. In 2008, the Management Plan was updated to include recent census data on the seal colony, which led to revision of the boundary to include part of the Ross Ice Shelf in the north-east where seals have been observed. The Area is now approximately 142km². Additional guidance on aircraft overflight and access has also been included.

The Weddell seal colony appears unable to relocate to another area because of its distance from the open ocean of McMurdo Sound, and as such it is highly vulnerable to any human impacts that might occur in the vicinity. The colony is not thought to have been present in the early 1900s, as there is no mention of seals by naturalists who visited White Island many times during Scott's 1902, 1903 and 1910 expeditions. An ice breakout occurred in the region between 1947 and 1956, and the first two seals were observed near the north-eastern end of the island in 1958 (R. Garrott, *pers. comm.* 2007). Year-round studies have detected no evidence of immigration or emigration of seals from the population, which appears to have grown to around 25 to 30 animals from a population of around 11 in the 1960s. The seals do not have the breathing capacity needed to dive the 20km required to reach the open ocean, and there is only one record of a seal from the colony making the journey over the ice shelf surface.

The seals gain access to the sea below the ice shelf through pressure cracks, which are formed by tidal motion and movement of the McMurdo and Ross ice shelves. Only one crack remains open year-round. The Weddell seals at White Island are on average greater in size and weight than their McMurdo Sound counterparts and have been shown to make more shallow dives. NW White Island is one of very few sites where Weddell seals are known to feed under shelf ice. The population is considered to have exceptional scientific value because of its period of physical isolation from interaction with other seals, thought to be around 60 years, and investigations are being undertaken of the extent to which the group may be considered a genetically distinct population. Genetic techniques have been used to construct a complete pedigree for the NW White Island population, which supports the conclusion that the year in which the colony was founded is likely to have been around 60 years ago, which agrees with historical sightings. NW White Island is relatively accessible by shelf ice from the nearby United States and New Zealand research stations at Hut Point, Ross Island. In addition, a flagged access route between these stations and Black Island traverses within approximately 2km of the Area (Map 1).

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The Area requires long-term special protection because of the exceptional importance of the Weddell seal colony, outstanding scientific values and opportunities for research, and the potential vulnerability of the Area to disturbance from scientific and logistic activities in the region.

2. Aims and objectives

Management at NW White Island aims to:

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the ecosystem, in particular on the Weddell seals, while ensuring protection from excessive disturbance or other possible scientific impacts;
- allow other scientific research provided it will not jeopardize the values of the Area;
- minimize the possibility of introduction of alien animals and microbes into the Area;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management activities

- Signs showing the location of the Area (stating the special restrictions that apply) shall be displayed prominently, and a copy of this management plan shall be kept available in appropriate places, in particular at McMurdo Station, Scott Base and at the Black Island facilities.
- Markers, signs or structures erected within the Area for scientific or management purposes shall be secured and maintained in good condition, and removed when no longer necessary.
- Visits shall be made as necessary (no less than once every five years) to assess whether the Area continues to serve the purposes for which it was designated and to ensure management and maintenance measures are adequate.
- National Antarctic Programs operating in the region shall consult together for the purpose of ensuring these steps are carried out.

4. Period of designation

Designated for an indefinite period.

5. Maps and photographs

- Map 1: NW White Island, ASPA No 137, topographic map.

Map specifications:

Projection: Lambert Conformal Conic; Standard parallels: 1st 78° 00' 00" S; 2nd 78° 12' 00" S; Central Meridian: 167° 05' 00" E; Latitude of Origin: 77° 30' 00" S; Spheroid: WGS84.

Inset 1: Ross Sea region.

Inset 2: Ross Island region, key features and nearby stations.

Note: Map 1 is derived from the Antarctic Digital Database (Version 5.0, SCAR, 2007). This framework has been identified as positionally inaccurate in the Ross Island / White Island

region. Accurate ground control available for Hut Point Peninsula was used to adjust the geographical position of the framework by approximately +240m (x direction) and +100m (y direction). This shift is considered to improve the accuracy of Map 1, but the result is only an approximation. Global Positioning Systems (GPS, in WGS-84) observations of seals shown on Map 1 are considered accurate to approximately 200m of their true positions.

6. Description of the Area

6(i) Geographical coordinates, boundary markers and natural features

White Island, part of the McMurdo volcanic complex, is situated approximately 20km SE of the edge of the McMurdo Ice Shelf and 25km SE of Hut Point, the location of McMurdo Station (United States) and Scott Base (New Zealand) on Ross Island (Inset 2, Map 1). The roughly triangular island is approximately 30km long and 15km wide at its maximum, and rises to a maximum elevation of 762m in several locations (Map 1). The northern and western shores of White Island descend steeply, with water depths of 600m occurring within 5km of the island. The island is predominantly ice-covered with most of the rock outcrops being in the north, and is completely surrounded by permanent shelf ice, between 10m and 100m in thickness, of the McMurdo Ice Shelf and Ross Ice Shelf. Black Island is situated 2.5km west of White Island, separated by the shelf ice of White Strait. The GPS entry and exit points for the access route to Black Island from McMurdo through White Strait are 78° 12' 00"S, 166° 50' 00"E and 78° 14' 17"S, 166° 45' 30" E, respectively.

The westward movement of the McMurdo Ice Shelf is greatest at the northern end of White Island and movement of ice away from the NW coast ensures open water in cracks in the shelf at this locality is present year-round. The Weddell seal population uses the cracks for access to seawater and feeding grounds under the shelf ice, and inhabits and breeds in the region within approximately 5km of their positions. The cracks occur parallel to and within a few hundred meters of the coast of White Island, and intermittently extend along the coast from the northern extremity of the island up to 15km to the south.

The Area includes 142km² of the shelf ice and open-water cracks of both the Ross Ice Shelf and McMurdo Ice Shelf up to 5km offshore north-east, north and west from the White Island coast. The north-eastern boundary extends from the north-eastern coast of Cape Spencer-Smith (167° 32' 42" E, 78° 00' 43" S) 5km due east to 167° 46' 37" E, 78° 00' 43" S. The boundary then extends north-west, and follows a line parallel to and 5km from the coast, around Cape Spencer Smith and then heading south-west to 167° 00' 00" E, 78° 05' 00" S. The boundary then extends due south for 7.8km to 167° 00' 00" E, 78° 09' 12" S, and thence 1.5km east to the southern-most significant outcrop of rock on the western coast of White Island (167° 05' 00" E, 78° 09' 12" S). The boundary then extends northwards, following the coastline around Cape Spencer Smith to the north-eastern limit of the Area. The White Island coast is distinguished by a change in surface slope where the transition between the floating ice-shelf and land occurs: the transition is in some places gradual and indistinct, and the exact position of the coast is not precisely known. For this reason the coastal (generally east) boundary of the Area is considered to follow the line of the coast as evidenced by a surface elevation rise towards the land of two meters above the average elevation of the adjacent McMurdo Ice Shelf.

The Weddell seal population was estimated at around 25 to 30 animals in 1991. A 1981 study estimated "about 30" seals, while 1991 studies estimated 26 seals greater than one year of age. Since 1991, 17 different females have produced pups at White Island. Between 2003 and 2007, 11 females have been sighted at White Island, but only six of these individuals have produced pups. Between two and four live pups were recorded in 1963-1968, 1981, and 1991. Annual censuses

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since 1991 recorded between four and ten pups from 1991 to 2000, but lower numbers (between two and four pups each year) from 2000 to 2007. Pup mortality is high, possibly due to inbreeding, and pup production is low in comparison to the population in Erebus Bay.

The seals are physically isolated by the barrier of the shelf ice, and are unable to swim the 20km distance under the ice to reach the seasonally open waters of McMurdo Sound: Weddell seals have been estimated to be capable of swimming a distance of around 4.6km (2.5 nautical miles) on a single breath. The apparent isolation of the colony is substantiated by tag observation data on Weddell seals in McMurdo Sound, where in more than 100,000 tag observations over a 20-year period no tagged seals from White Island have been observed in McMurdo Sound. These data suggest that the White Island seals do not generally traverse the 20km distance to the open ocean over the surface of the shelf ice. However, there is at least one record of a yearling from the White Island colony found to have made the journey across to the Williams airfield close to McMurdo station (G. Kooyman, *pers. comm.* 2007).

Adult female seals begin to appear on the shelf ice in early November, one month later than other pupping areas in the southern Ross Sea. They pup at the NW extremity of the island during which time sub-adults and non-breeding adults can be found up to 15km to the SW near open cracks on the west side of the island. Adult male seals are not observed on the sea-ice during this time, remaining in the water to establish and defend territories. The females remain on the ice until pups are weaned at about 6-8 weeks of age. After December, adults and sub-adults mix in the pupping area and along the cracks formed at the NW corner of the island.

It is thought that the harsh surface conditions confine the seals to the water during the winter months. Winter surface temperatures reach as low as -60°C and it is thought that the seals expend considerable time maintaining an open air hole in the cracks. This is thought to be a key factor limiting the population size, with pups and sub-adults possibly excluded from use of the limited breathing holes by more dominant and aggressive adults. Some pups may be unable to maintain their own breathing holes and may become trapped on the ice surface if dominant seals do not allow them entry into the water.

Studies have suggested that the Weddell seals at White Island have a similar diet to their counterparts at McMurdo Sound. Studies of fish otoliths recovered from Weddell seal fecal samples have revealed a diet comprised primarily of the nototheniid fish *Pleuragramma antarcticum*, also with fish from the genus *Trematomus*. Invertebrates are thought to comprise the remainder of the diet along with a cephalopod belonging to the family Mastogoteuthidae. Consumption of the latter was found to be considerably greater amongst White Island seals than those at McMurdo Sound.

Other aspects of the physiology and behaviour of seals at White Island appear to differ from nearby populations at McMurdo Sound and at Terra Nova Bay: the seals at White Island appear to be significantly fatter, with recorded weights of up to 686 kg (1500 lb.) at White Island compared to no more than 500 kg at McMurdo Sound or Terra Nova Bay. A 1991 study revealed that on average adult female seals are considerably longer than those in McMurdo Sound, and young seals at White Island have been observed to exhibit faster growth rates than their McMurdo counterparts. Average diving depths at White Island are shallower than at McMurdo Sound.

6(ii) *Restricted and managed zones within the Area*

None.

6(iii) *Structures within and near the Area*

There are no structures within or near the Area.

6(iv) Location of other protected areas within close proximity of the Area

The nearest protected areas to NW White Island are on Ross Island: Arrival Heights (ASPA No 122) adjacent to McMurdo Station and Discovery Hut (ASPA No 158) on the Hut Point Peninsula are the closest at 20km to the north; Cape Evans (ASPA No 155) and Cape Royds (ASPA No 121) are 47km and 55km north respectively; and Tramway Ridge (ASPA No 130) near the summit of Mt. Erebus is 60km to the north.

7. Permit conditions

Entry into the Area is prohibited except in accordance with a permit issued by appropriate national authorities. Conditions for issuing a permit to enter the Area are that:

- it is issued only for scientific study of the Weddell seal ecosystem, or for scientific reasons or management purposes consistent with plan objectives such as inspection or review;
- the actions permitted will not jeopardize the ecological or scientific values of the Area;
- any management activities are in support of the objectives of the Management Plan;
- the actions permitted are in accordance with the Management Plan;
- the Permit, or a copy, shall be carried within the Area;
- a visit report shall be supplied to the authority named in the Permit;
- Permits shall be issued for a stated period.

7(i) Access to and movement within the Area

- Access into the Area is permitted on foot, by vehicle, or by aircraft.
- Aircraft landings and overflight below 750m (~2500 ft) within the Area are prohibited without a permit. Aircraft approach and departure shall avoid overflight of the White Island coastline and tide-cracks within the Area, where the seals are most commonly found. Aircraft shall not land closer than 300m from seals where they can be seen from the air, and shall land at least 300m (~980 ft) away from the coastline of White Island and the tide-crack when seals are not visible.
- Use of helicopter smoke grenades is prohibited unless absolutely necessary for safety, and all grenades should be retrieved.
- Vehicles are strongly discouraged from approaching closer than 50m from seals, and closer approaches should be on foot. Vehicle and pedestrian traffic should be kept to the minimum necessary consistent with the objectives of any permitted activities.

7(ii) Activities that are or may be conducted in the Area, including restrictions on time or place

Activities that may be conducted within the Area include:

- scientific research that will not jeopardize the ecosystem of the Area;
- essential management activities, including monitoring.

7(iii) Installation, modification or removal of structures

- No structures are to be erected within the Area except as specified in a permit;
- All scientific equipment installed in the Area must be authorized by permit and clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area;

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- Removal of specific equipment for which the permit has expired shall be the responsibility of the authority which granted the original Permit, and shall be a condition of the permit.

7(iv) Location of field camps

Permanent field camps are prohibited within the Area. Temporary campsites are permitted within the Area. There are no specific restrictions to a precise locality for temporary camp sites within the Area, although sites selected shall be more than 200m from the ice-shelf cracks inhabited by the seals, unless authorized by permit when deemed necessary to the accomplishment of specific research goals.

7(v) Restrictions on materials and organisms that can be brought into the Area

- No living animals, plant material or microorganisms shall be deliberately introduced into the Area and precautions shall be taken against accidental introductions. Of particular concern are microbial and viral introductions from other seal populations. To minimize the risk of introductions, visitors shall ensure that any measuring devices, sampling equipment, markers or personal equipment to be used in the area are clean before entering the Area;
- No herbicides or pesticides shall be brought into the Area;
- Any other chemicals, including radio-nuclides or stable isotopes, which may be introduced for scientific or management purposes specified in the permit, shall be removed from the Area to the maximum extent practicable at or before the conclusion of the activity for which the permit was granted;
- Fuel is not to be stored in the Area, unless required for essential purposes connected with the activity for which the permit has been granted;
- All materials introduced shall be for a stated period only, shall be removed at or before the conclusion of that stated period, and shall be stored and handled so that risk of their introduction into the environment is minimized.

7(vi) Taking or harmful interference with native flora or fauna

Taking or harmful interference with native flora and fauna is prohibited, except in accordance with a separate permit issued under Article 3 of Annex II by the appropriate national authority specifically for this purpose.

7(vii) Collection or removal of anything not brought into the Area by the permit holder

Material may be collected or removed from the Area only in accordance with a permit and should be limited to the minimum necessary to meet scientific or management needs. Material of human origin likely to compromise the values of the Area, which was not brought into the Area by the permit holder or otherwise authorized, may be removed unless the impact of removal is likely to be greater than leaving the material *in situ*: if this is the case the appropriate authority should be notified.

7(viii) Disposal of waste

All wastes shall be removed from the Area.

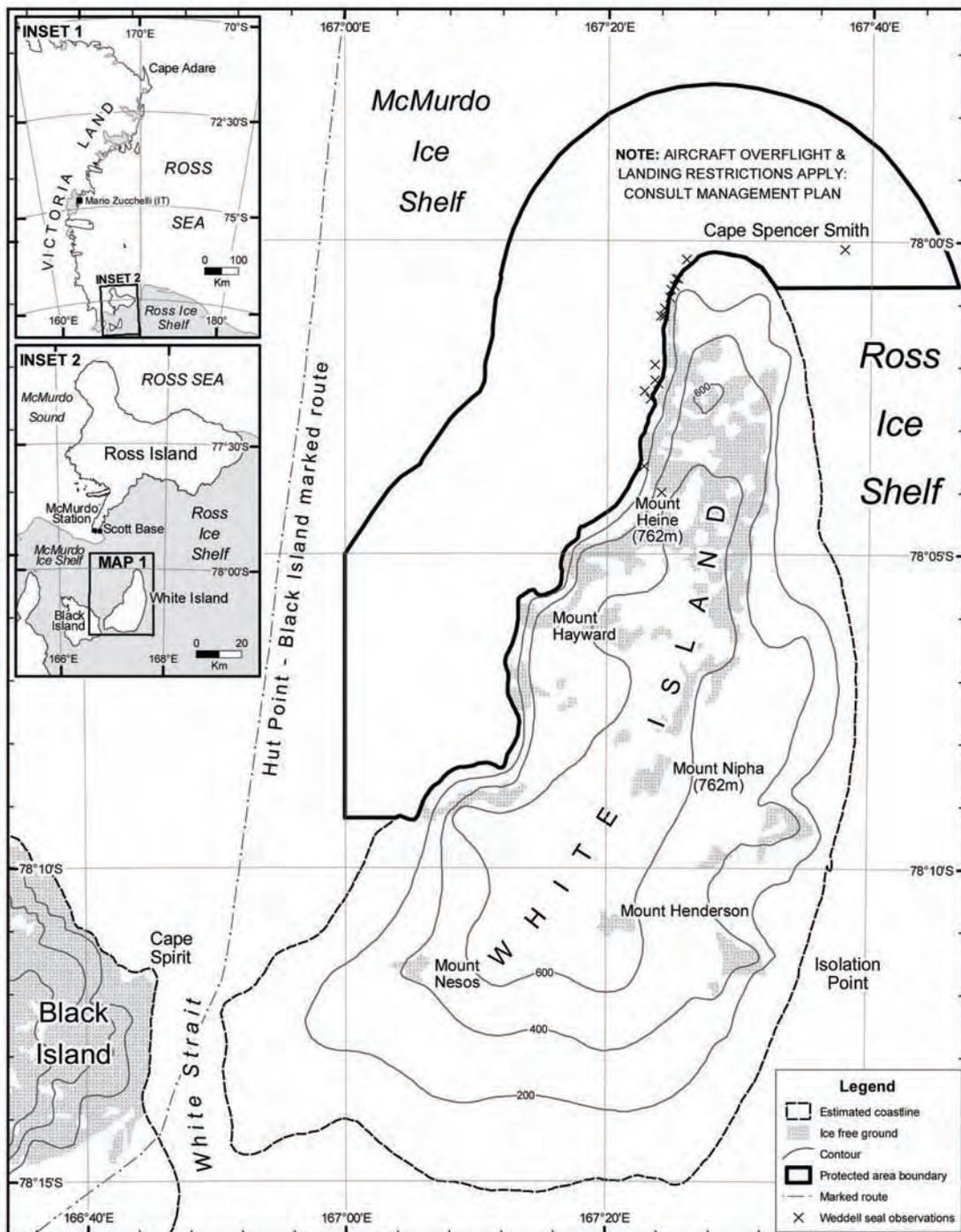
7(ix) Measures that are necessary to ensure that the aims and objectives of the Management Plan can continue to be met

- Any specific sites of long-term monitoring shall be appropriately marked;
- The use of explosives is prohibited within the Area.

7(x) Requirements for reports

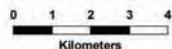
- Parties should ensure that the principal holder for each permit issued submits to the appropriate authority a report describing the activities undertaken. Such reports should include, as appropriate, the information identified in the Visit Report form suggested by SCAR.
- Parties should maintain a record of such activities and, in the Annual Exchange of Information, should provide summary descriptions of activities conducted by persons subject to their jurisdiction, which should be in sufficient detail to allow evaluation of the effectiveness of the Management Plan. Parties should, wherever possible, deposit originals or copies of such original reports in a publicly accessible archive to maintain a record of usage, to be used both in any review of the Management Plan and in organizing the scientific use of the Area.

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Projection: Lambert Conformal Conic; CM 167°05', SP1 78°, SP2 78°10', LO 77°30'; Spheroid: WGS84; Contour interval: 200 m. Data sources: Topography - ADD v5.0 (horizontally adjusted (100m N and 240m E) to match Hut Point GPS data); Hut Point - Black Island route RPSC Kinematic GPS; Seal observations - R. Garrott

ASPANo. 137: NW White Island
Map 1: Topographic map



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